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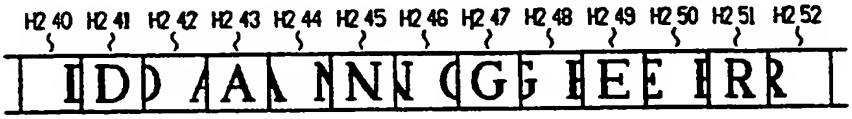

(57) Abstract

A holographic display device particularly useful for displaying information in the form of words is made up of an array of identical holograms each containing all the patterns necessary to form the whole of the information to be displayed. Each hologram is formed either using a master hologram or directly by creating multiplexed patterns from a number of different parts of the information to be displayed. Such a display creates the impression of an image which moves with the viewer which is advantageous for warning signs or road signs.

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HOLOGRAMS

The present invention relates to holograms and a method of making holograms, and apparatus for making holograms.

Conventional holograms produce a three dimensional image such that the viewer will see a different aspect of the image depending on where he or she is standing in relation to the image. For certain applications it would be advantageous to provide a hologram which produced an image which presented the same information, however it was viewed, such a hologram would be useful for display signs for example. The hologram would typically have different parts of a photo-sensitive plate separately exposed to interference fringes formed by different parts of the object to be imaged.

Thus, if the object is a word, i.e. two dimensional letters, the word may be divided into a series of letters or parts of letters and each letter or part used as a separate object for the purpose of forming interference fringes. The resulting fringes are recorded on a specific portion of a photographic plate so that each portion of the plate relates to a different portion of the word.

UK-A-1292110 discloses a display made in accordance with this process. The intention of this UK patent application is to provide a road sign which can display one of a number of different pieces of information either as a static display or as an alternating display between two words. The problem with this previous proposal is that whatever message is displayed is fixed in space and the change in the message displayed is under the control of the apparatus as it requires different illuminating light sources to be activated so as to change the angle of illumination

and hence the message displayed.

Another display arrangement is disclosed in WO-A-89/08304 where a sign is disclosed which comprises an array of elements each comprising a first lens and a second lens and an optical object in registry with the first and second lenses such that the virtual image of the optical object formed in the second lens lies on the focal surface of the first lens. The optical objects consist of a representation of the information which the sign is to present. The optical objects are substantial identical to each other and the image of the optical objects seen by a viewer moving past the sign thus appears to be stationary with respect to the viewer. There is no disclosure in this earlier document of the use of holographic material as the optical object and consequently the advantages to be obtained by using holographic material are not suggested by this earlier document.

Holographic material has been used in a number of different types of optical systems and UK-A-1233242 discloses an optical system utilizing a holographic material for creating an array of identical images in two dimensions from a single hologram by illuminating the hologram with reference light sources at varying angles depending on the spacing of the array of images. The application suggested for this apparatus is the production of semiconductor devices which require extremely accurate images to be transferred to a photo-resist layer in a contactless manner so as to avoid imperfections and loss of resolution which would otherwise occur if a contact process were utilized.

The present invention provides a visual display device comprises a plurality of identical elements, each element consisting of a hologram having a plurality of multiplexed patterns corresponding respectively to a plurality of different images stored

by the hologram.

The present invention further provides a method of forming a holographic display device comprising illuminating a first part of an object to be viewed, recording on different parts of a first hologram element first interference patterns corresponding to respective different views of the first part of the object, illuminating a further part of the object to be viewed, recording on further different parts of the first hologram element further interference patterns corresponding to respective different views of the further part of the object, creating further hologram elements with recorded first and further interference patterns identical to the patterns recorded on the first hologram element, and assembling hologram elements thus formed into a display.

Certain embodiments of the invention will now be described by way of example only and with reference to the accompanying drawings in which:

Figure 1 is a schematic diagram illustrating how a conventional hologram is formed;

Figure 2 is a schematic diagram illustrating the formation of a conventional multiplexed hologram;

Figures 3a and 3b are schematic diagrams illustrating a first method of making holograms according to the present invention;

Figure 4 is a schematic diagram illustrating a master hologram made by the method shown in Figure 3;

Figures 5a and 5b show how a transfer hologram may be formed from a master hologram;

Figure 6 shows an array of secondary holograms made from the master hologram in Figure 4;

Figures 7a to 7e show various holographic images seen by viewing the array of Figure 6 from different positions;

Figures 8 to 11 show various arrangements of

equipment for producing a hologram as shown in Figures 6 and 7;

Figures 12a and 12b are schematic diagrams illustrating a further method of making holograms according to the present invention;

Figure 13a shows an array of secondary holograms made from the master hologram shown in Figure 12a;

Figures 13b to 13h show various holographic images seen by viewing the array of Figure 13a from different positions;

Figures 14 and 14b are schematic diagrams illustrating a further method of making holograms according to the present invention; and

Figures 15 and 15a to 15e show a further method for producing a master hologram according to the present invention.

According to a first embodiment of the invention a master hologram is made by a technique similar to that used in for so-called "multiplexed holograms". To facilitate an understanding of this embodiment, conventional holograms and then multiplexed holograms will first be briefly described.

Figure 1 is a schematic diagram illustrating the process for production of a conventional hologram, which is formed by photographically recording an interference pattern between coherent radiation Es scattered from an object 10 and a reference beam of coherent radiation, ER. The photo-sensitive plate 11 is developed and suitably illuminated to reconstruct an image.

In Figure 1 the reference beam and scattered object beam are produced from the same source, the reference beam being reflected from a mirror 12.

Figure 2 illustrates diagrammatically the formation of a multiplexed hologram. A multiplexed

hologram is formed using a series of slides 13 or other suitable transparencies, projected using laser light onto a diffusion or projection screen 14, showing different views of the object instead of the original three dimensional object. The interference pattern from each slide is exposed onto an appropriate portion 11a of a photo-sensitive plate 11 while the rest of the plate is masked off. The mask is then moved to the adjacent portion of the photo-sensitive plate (in direction D), and the photo-sensitive plate is exposed to the next projected image. Once developed and appropriately illuminated the plate has recorded a continuous series of stereographic images creating a three dimensional illusion.

A conventional or multiplexed hologram of the type described above is referred to as a master hologram.

A master hologram may be used to make further holograms by various techniques. The further holograms are variously referred to as copy holograms, secondary holograms and transfer holograms.

Figures 3 to 6 illustrate a very simple example of a method of making a hologram according to the present invention. In this example the desired holographic image is a sign displaying the words DANGER. The reference beams have been left out for the sake of clarity, although they are essential for forming the interference patterns with the object light (Es).

As shown in Figure 3, using a technique similar to the multiplexed hologram technique described above, different parts of a photographic plate are exposed to different interference fringes so that the final complete pattern represents the whole word.

Thus, as shown in Figure 3a, a portion of a photo-sensitive plate 20 is exposed to interference fringes formed by scattering laser light (Es) through an

object 21 in the shape of a letter "D". (The letters are reversed in Figure 3, as they are read from the direction of the photographic plate.) The object may be a stencil or a letter painted on a transparent plate for example. The remainder of the plate 20 is protected by a baffle 22. Then, in Figure 3b a second portion of the plate is exposed to the patterns formed by the letter "A" object 23 using a baffle 24 and so on through to the end of the word.

Once the master hologram 20a has been made and is re-illuminated the viewer sees, at position (X), the letters D, A, N, G, E, R when looking from positions 1, 2, 3, 4, 5, 6 respectively (Figure 4). Or conversely the letters are seen from angles a, b, c, etc.

Using the master hologram (hereafter H1), a transfer or a copy hologram (hereafter H2) is made by traditional methods.

For example, in Figure 5a the H1 hologram is illuminated using laser light Es. This creates an optical image of the original objects. A second photo-sensitive plate H2 is placed at the position of this image and "referenced" with a secondary laser beam ER causing an interference pattern at the H2 which is then developed to form the copy hologram.

When the H2 hologram is illuminated (Figure 5b), the image of the original H1 floats in space in front of the H2.

When the viewer looks through his H1 image at the H2 from the relative positions a1, a2, a3, a4, a5, a6, the letters appear D, A, N, G, E, R etc respectively (Figure 5b).

By paneling an array of these H2 holograms, all identical to each other, (Figure 6) an interesting effect occurs. Looking from position Y1, in front of an array of 6 H2 holograms, because of the angular relationship to each H2 panel, the viewer would see the letter "D" at H2-31, the letter "A" at H2-32, the letter

"N" at H2-33, the letter "G" at H2-34, the letter "E" at H2-35 and the letter "R" at H2-36. In other words the viewer would see the whole word spelt across six identical holograms (Figure 7a).

If the viewer then moves sideways towards Y2, because all holograms are identical to each other and contain all the information to be conveyed and the angular relationship to the H2's is preserved, so the word kinetically moves with the viewer. At Y2 the word "DANGER" appears between H2-35 and H2-40 (Figure 7b). Note especially that when the panel H2-35 is viewed from Y1 the viewer sees the letter "E" whereas from Y2 the viewer sees the letter "D".

If the viewer moves further away from the array of H2's (for example to position Y3, Figure 6), the image of "DANGER" will be spread over a greater number of holograms. The holograms which are totally seen by the viewer are those at the same angle with respect to the viewer as when viewed at Y1 or Y2, i.e. from H2-41 to H2-51. This crude example will have a crude result (Figure 7c), however if the image to be used was divided into perhaps 1000 parts with 1000 different exposures instead of 6 parts and 6 exposures (Figure 7d) the resulting image would be much smoother (Figure 7e). So as the viewer moves closer and further from the H2's the effect of compression and extension of the image would take place, due to changes in angle of view of each hologram.

The following relates to possible arrangements of equipment for producing holograms according to the invention.

Figure 8 shows one arrangement for producing H1 holograms necessary for this invention. The photo-sensitive plate 80 has a baffle or mask 81 in front of it. The mask 81 allows exposure of consecutive parts of the photo-sensitive plate 80 as the mask is moved in

direction 82 between exposures. A stencil, drawing, transparency or any image-forming device 83 is placed in front of a diffusion screen 84. The diffusion screen is suitably illuminated by laser light (Es). This light only needs to cover the area 86 of the diffusion screen 84 which is the size of the single copy holograms, which will be later grouped into an array. The stencil is also moved in direction 82 between exposures.

If the length of the image is similar to the length of the H1 hologram then an optional link 85 can be used to move mask and stencil in synchronisation with each other. However images longer or shorter than the photo-sensitive plate can also be made in which case the mask and stencil would be moved at different rates over the H1 production period. In this case the optional link would not be used.

Figure 9 shows another scenario where the photo-sensitive plate 90 and its' baffle 91 act similarly to the example of Figure 8. In Figure 9 the stencil is replaced by using a projection device 93 through which laser light (Es) is projected through a transparency 95 onto a diffusion/back-projection screen 94. The baffle 91 would be moved in direction 92 and the transparency changed to a different image between exposures. These images would be equivalent to the moving stencil. It will be appreciated that for clarity the images in Figure 9 are a crude version. In a smooth version only consecutive vertical slices of letters, words or images would be used.

Figure 10 describes the way in which one copy hologram H2 can be made from the H1 hologram by traditional means. Figure 10 shows the master hologram H1 and forming an image of overlapping letters at 116. A single photo-sensitive plate H2 is then placed close to the plane of that image and referenced by more laser light ER. This is then developed to form a hologram H2.

Many H2's would be made by this method and then panelled together into an array.

Arrays of H2's could also be made using a "step and repeat" mechanism as in Figure 11. This is similar to Figure 10 except that a static baffle 117 is placed either side of the source image to mask off unwanted source light Es and H2 reference light ER. Behind the baffle is a length of unexposed photo-sensitive plate or film H2 which is moved in direction 118 between exposures. By this method an array of secondary holograms can be produced on one piece of photo-sensitive material.

A further development of this invention would be to make a master hologram in which the image to be recorded has been divided up along the vertical axis (hereafter Y) as well as the horizontal axis (hereafter X) (Figure 12a). In this example laser light Es is passed through a diffusion screen 121 and then through part of a stencil 122. Some of this light forms interference fringes with the reference light ER when they meet at the photo-sensitive plate (hereafter P1). There is a baffle 123 which has a hole cut in it 124 so that only the appropriate portion of P1 is exposed. The stencil 122 and the baffle 123 would be moved between exposures, firstly in direction X to form a row of exposed P1. The stencil and baffle would then be moved up one row in direction Y and the procedure repeated until P1 is fully exposed. The diffusion screen 121 and the photo-sensitive plate P1 do not move throughout the whole process.

The equipment shown in Figure 12a could be modified in the same way as Figures 8 and 9.

Portions of the photo-sensitive plate will be exposed to portions of the stencil in an inverse relationship. Figure 12b is a schematic diagram showing this relationship, so that portion P/1, P/2, P/3, P/4,

P/5, P/6, P/7, P/8, P/9 etc of the photo-sensitive plate P1 will be exposed to portions S/1, S/2, S/3, S/4, S/5, S/6, S/7, S/8, S/9 etc of the stencil 122.

In the above example (Figure 12a), the photo-sensitive plate would be developed by traditional means to form an H1 master hologram. Many copy holograms (H2s) would be made by traditional methods or by a step and repeat method similar to those shown in Figures 10 and 11. These holograms would be tiled together into a two dimensional array of holograms H2s by various methods (Figure 13a). For the clarity of the following examples a picture frame 131 has been placed around the array of holograms.

Figure 13b shows example viewing positions E1, E2, E3, E4 and E5, all perpendicular to the H2 array (H2s), and looking towards XY1, XY2, XY3, XY4 and XY5 respectively. Figure 13c shows the stencil image with border as used in this example 132. Figures 13d, 13e, 13f, 13g and 13h show what the viewer would actually see from positions E1, E2, E3, E4 and E5 respectively. Figures 13d to 13h are drawn in perspective, meaning that the frame 131 around the array of holograms (H2s) is smaller as the viewpoint is further away and larger as it is closer. It is important to note that the image 132 of the jug always remains the same size relative to the viewpoint regardless of the distance from the array. The converse is also true, in that, if the holographic array of H2s is moved past the viewer and the viewer is static, then the image does not change (provided that the viewer is always at 90 degrees to the plane of the array).

Figure 14 shows a method of making an XY array of holograms, without first producing a master hologram, with a similar result to that of Figures 13a to 13h. In this case, instead of using a master hologram to project the image, a stencil (141) and a diffusion screen (142)

are used to deflect/scatter the coherent light (Es) through the stencil, which is between the diffusion screen and the photo-sensitive medium (Pl). Some of the light (Ess) will reach the photo-sensitive medium (Pl) through an aperture (144) in the mask (145). A reference beam of coherent light (ER) is directed to the same position from an appropriate angle (AR), forming interference fringe patterns which can later be developed to produce a hologram. The photo-sensitive medium (Pl) is moved sequentially in directions X and Y with respect to the mask which is stationary so that the fringe patterns can be exposed to it. The photo-sensitive medium is in turn developed into an array of holograms. The hologram could be of the type known as a "Reflection Hologram" or "Transmission Hologram" or "Edge-lit Hologram" or indeed any practical method of making holograms.

Figure 14b is an example of how the resulting array of holograms might look from a position Vl. Here the phenomenon of the angular relationship of image to surface is maintained, giving similar visual results to those described here in Figures 13a to 13h. It also shows how, because of the angular relationship of each array element to the eye, the resulting image will appear to be inverted.

In this case, if it were desired to improve the resulting image quality/sharpness, a small aperture could be specified in the mask (144). The sharpness of the image will also be greatly effected by the type, quality and design of the final illumination source.

An optional lens (not shown), or other focussing device, could be placed between the stencil (141) and the aperture (144) to maximise the amount of light (Ess) reaching the photo-sensitive plate.

Another method for producing an array of holograms in the X and Y axes is quite similar to that

of Figure 14, and so in this instance we will describe this new method with reference to Figure 14. In this version the light (Es) must firstly be spread to adequately cover the stencil as before. It must then be redirected through the stencil (141), to the desired position on the photo-sensitive material (144), by using a suitable focussing device such as a large, positive focal length, lens (not shown). The lens would replace the diffusion screen (142) and so the light would no longer be scattered (143). Instead each individual ray of light (Ess) will converge towards the focussing point (144) at an angle unique to its spatial position. A suitable reference beam of light (ER) is then required to form the necessary interferenced patterns, in order to make an array of holograms as with the previous example. Again, the directional/angular relationship of image to surface is maintained and, once the resulting array of holograms is produced and lit, will give similar image phenomena to those described here and shown in Figures 13a to 13h and Figure 14b.

Figure 15 shows a further method for producing a master hologram, according to the present invention. In this embodiment a beam of coherent reference light is directed to the photo-sensitive plate (P1) at a suitable angle (AR). Another beam of coherent light is focussed by a lens (151) so that it converges to the same point (152) on the photo-sensitive plate (P1) forming an interference pattern which can be later developed. The photo-sensitive plate is moved in the horizontal and vertical directions, and exposures made consecutively, forming an array of interference patterns which can be developed. This array could be similar in position to the picture cells (or pixels) of a cathode ray tube, computer or television screen. If selective exposures are made, i.e. the laser beam is switched on and off so that not every position in the plate is exposed, designs

could be built up to produce a master hologram of unexposed and exposed areas.

It is also true to say that exposures do not necessarily need to be made in a grid fashion and could be made consecutively in any direction in the X Y plane by moving the photo-sensitive plate. This could be construed as a method of "drawing" the exposures in a vector format.

Once the photo-sensitive plate is developed, the resulting master hologram is suitably illuminated by coherent light. Figure 15a shows such a master which, for clarity and example, has been sequentially exposed in the form of the letter "R". Every array element of the exposed parts of the master will diffract an image of the lens (Figure 15b). This effectively means that the light will fan out from each point on the master hologram, through a broad angle (153,154). As the light spreads from each pixel point (Figure 15c), it can be seen that, at a certain distance from the master (Figure 15d) there are spatial locations (155) which receive light from every diffracting array element of the master hologram. This "sub-set" position (155) receives light from each array element as shown in Figure 15e. This master hologram can then be used to produce an array of secondary holograms, hitherto described.

It will be appreciated that a hologram according to this invention can be made by numerous methods and is not limited to the specific examples described above. For example, any appropriate photo-sensitive material could be used for the production of the master or transfer holograms. Alternatively they may be produced by other methods such as the formation of relief patterns by embossing, engraving, etching, casting or moulding or any other optical, electronic, magnetic or storage technique.

An application of this invention could be in

the sign industry with road signs easily legible from any distance.

Or signs of arrows which follow the viewer, kinetically guiding them. For example, a sign with arrows and text, in which as the viewer looks to the left he or she can always read the words "Way Out" and when looking to the right he or she can read the words "No Exit". This would be a useful form of public flow control in such places as Airports, Museums, Railway stations, Public buildings etc.

Or in roll-tape form as kinetic de-lineation markers in crowd/traffic flow control situations.

Or as an optical protractor with markers which remain at a specific angle to the viewer.

Or for use as security measure to prevent forgery of certain products such as credit cards.

Or as a security key/identity system.

Or as part of a product counting/ identification conveyer system. For example, as the product, with an array hologram on it, passes the viewer or viewing device at any speed, the image on the hologram remains static relative to the viewer.

Or as a kinetic packaging or gift wrapping, or a sign which follows any linear route.

Application of the XY field array hologram include:-

road signs in which the image stays the same size from any distance;

signs which animate as the viewer gets closer.

An application might be a "Slow Down" sign of animated Slow Down chevrons as a driver nears a bend.

CLAIMS:

1. A visual display device comprises a plurality of identical elements, each element consisting of a hologram having a plurality of multiplexed patterns corresponding respectively to a plurality of different images stored by the hologram.

2. A display device according to claim 1, wherein the plurality of identical elements are aligned in one direction.

3. A display device according to claim 1, wherein the plurality of identical elements are aligned in two directions to form a two dimensional array.

4. A display device according to claims 1, 2 or 3 wherein the display is arranged to display a word or words and each hologram contains all the information required for the word or words.

5. A display device according to any one of the preceding claims and further comprising means for uniformly illuminating the plurality of identical elements.

6. A method of forming a holographic display device comprising illuminating a first part of an object to be viewed, recording on different parts of a first hologram element first interference patterns corresponding to respective different views of the first part of the object, illuminating a further part of the object to be viewed, recording on further different parts of the first hologram element further interference patterns corresponding to respective different views of the further part of the object, creating further

hologram elements with recorded first and further interference patterns identical to the patterns recorded on the first hologram element, and assembling the hologram elements thus formed into a display.

7. A method according to claim 6, wherein the object is an alphanumeric character and each part constitutes a part of the character.

8. A method according to claim 6, wherein the object is a word and each part constitutes a part of each letter of the word.

9. A method according to claim 6, 7, or 8 wherein the first hologram element is a master hologram and the further hologram elements are secondary holograms created from the master.

10. A method of forming a hologram for a display device comprising illuminating a first part of an object to be viewed on the display, recording on different parts of a hologram element first interference patterns corresponding to respective different views of the first part of the object, illuminating a further part of the object to be viewed, and recording on further different parts of the hologram element further interference patterns corresponding to respective different views of the further part of the object.

11. A method according to claim 10, wherein the object is an alphanumeric character and each part constitutes a part of the character.

12. A method according to claim 10, wherein the object is a word and each part constitutes a part of each letter of the word.

13. A method according to claim 10 wherein the object is a word and each part constitutes a letter of the word.

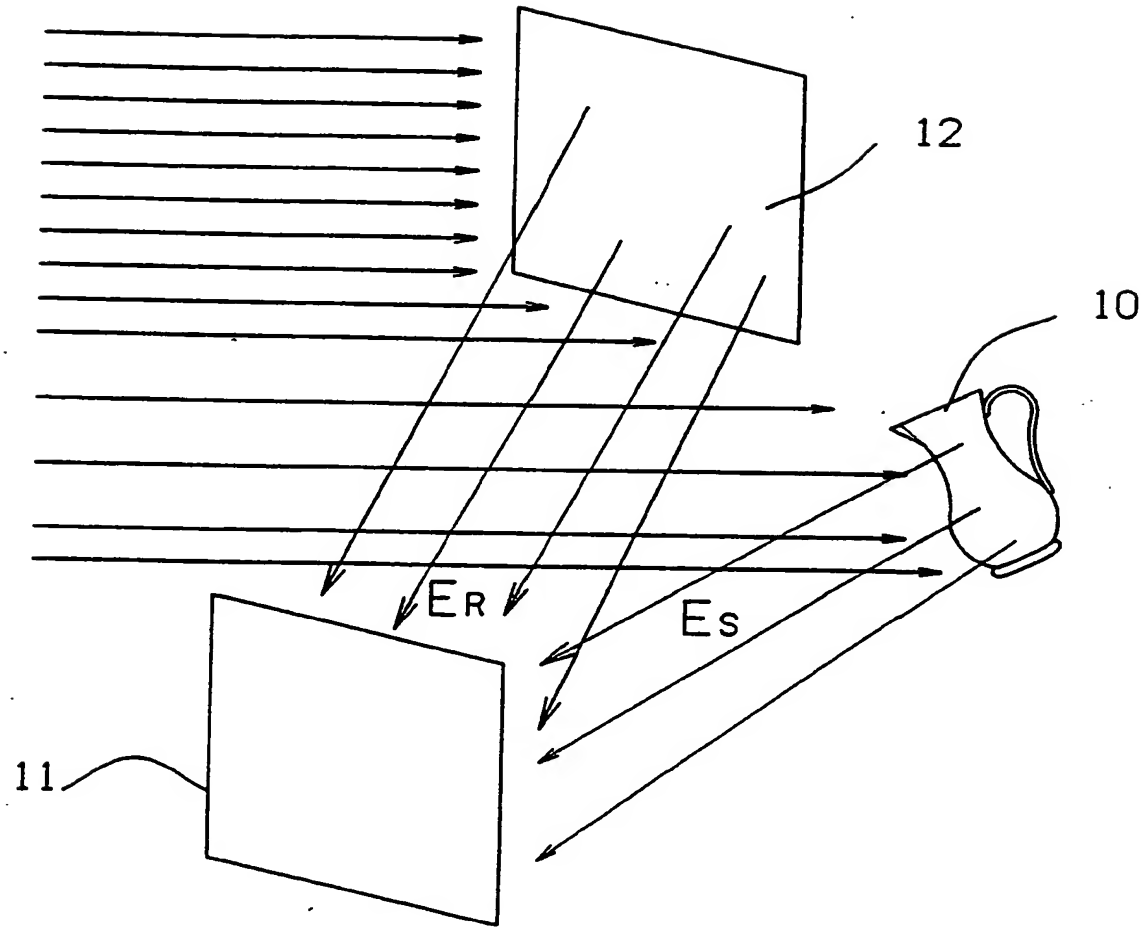


Figure 1

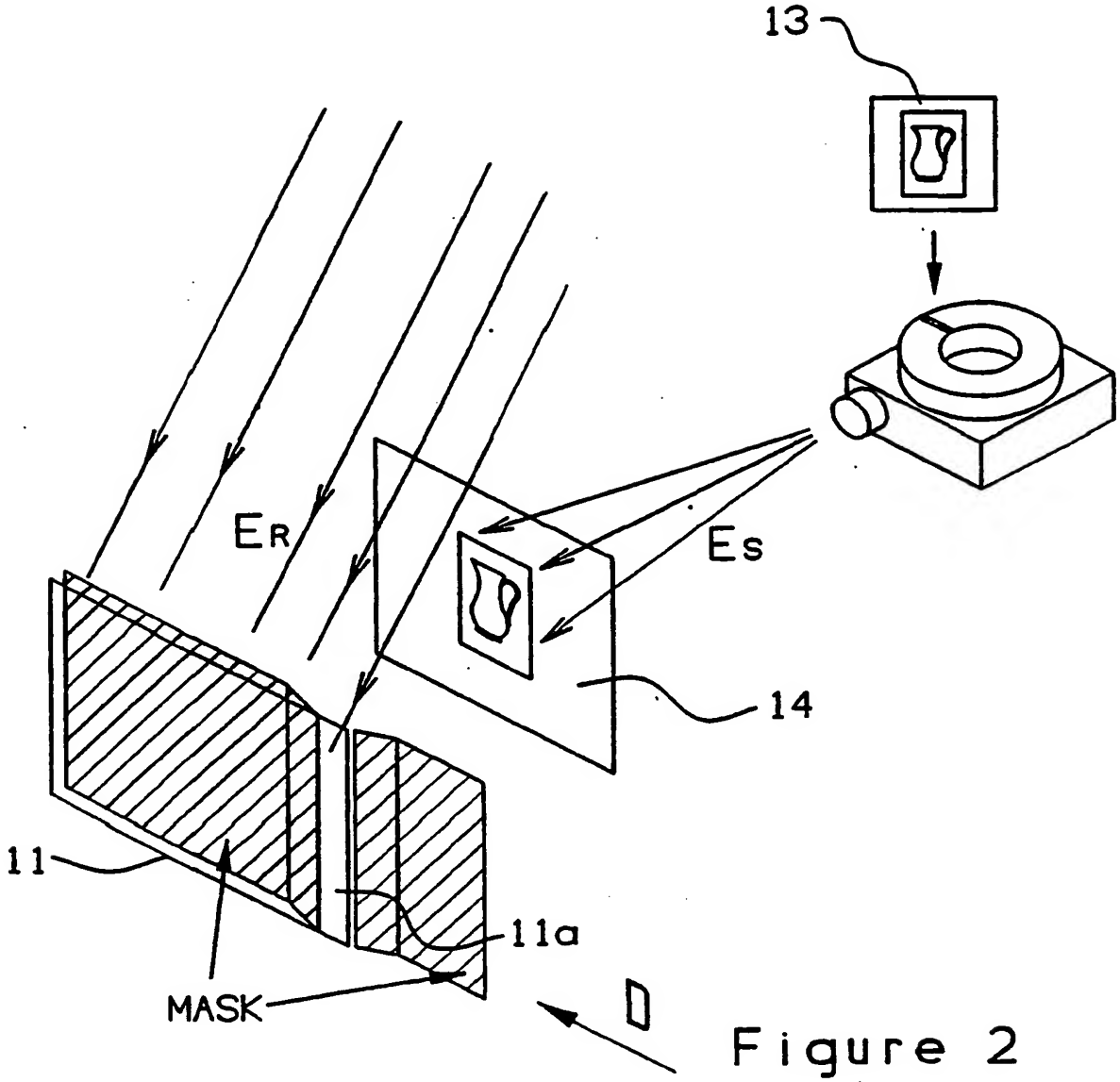


Figure 2

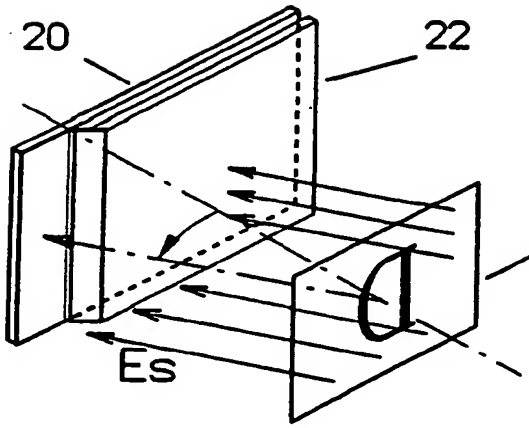


Figure 3a

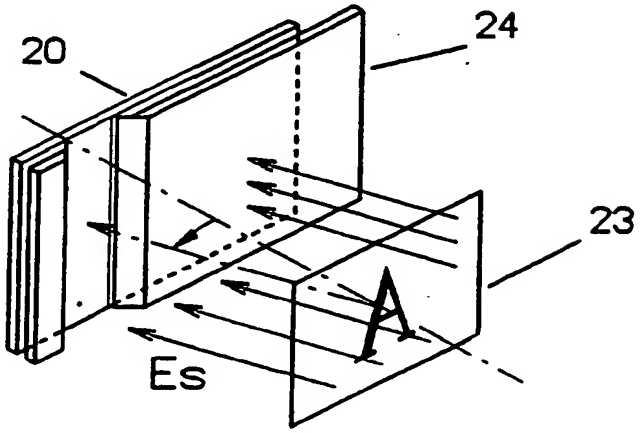


Figure 3b

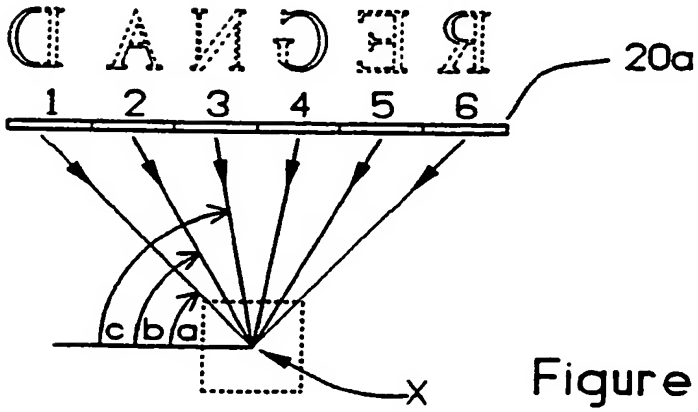


Figure 4

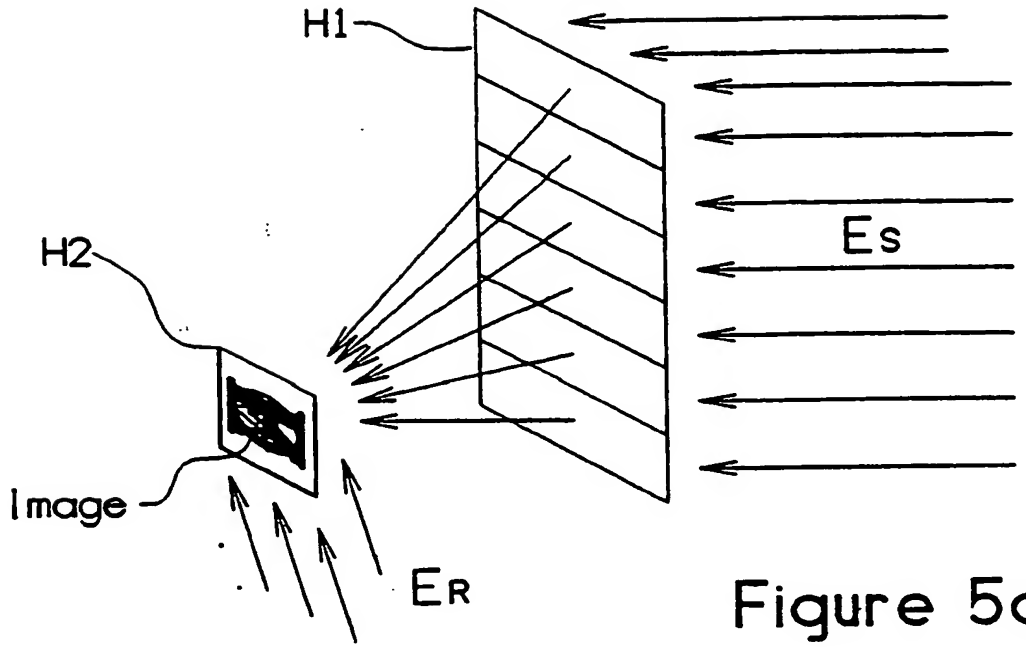


Figure 5a

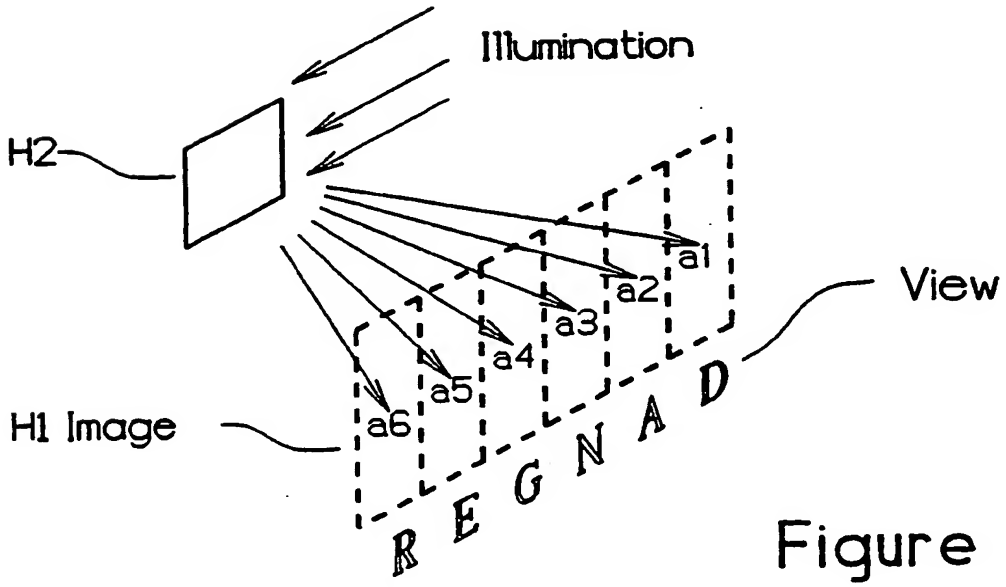
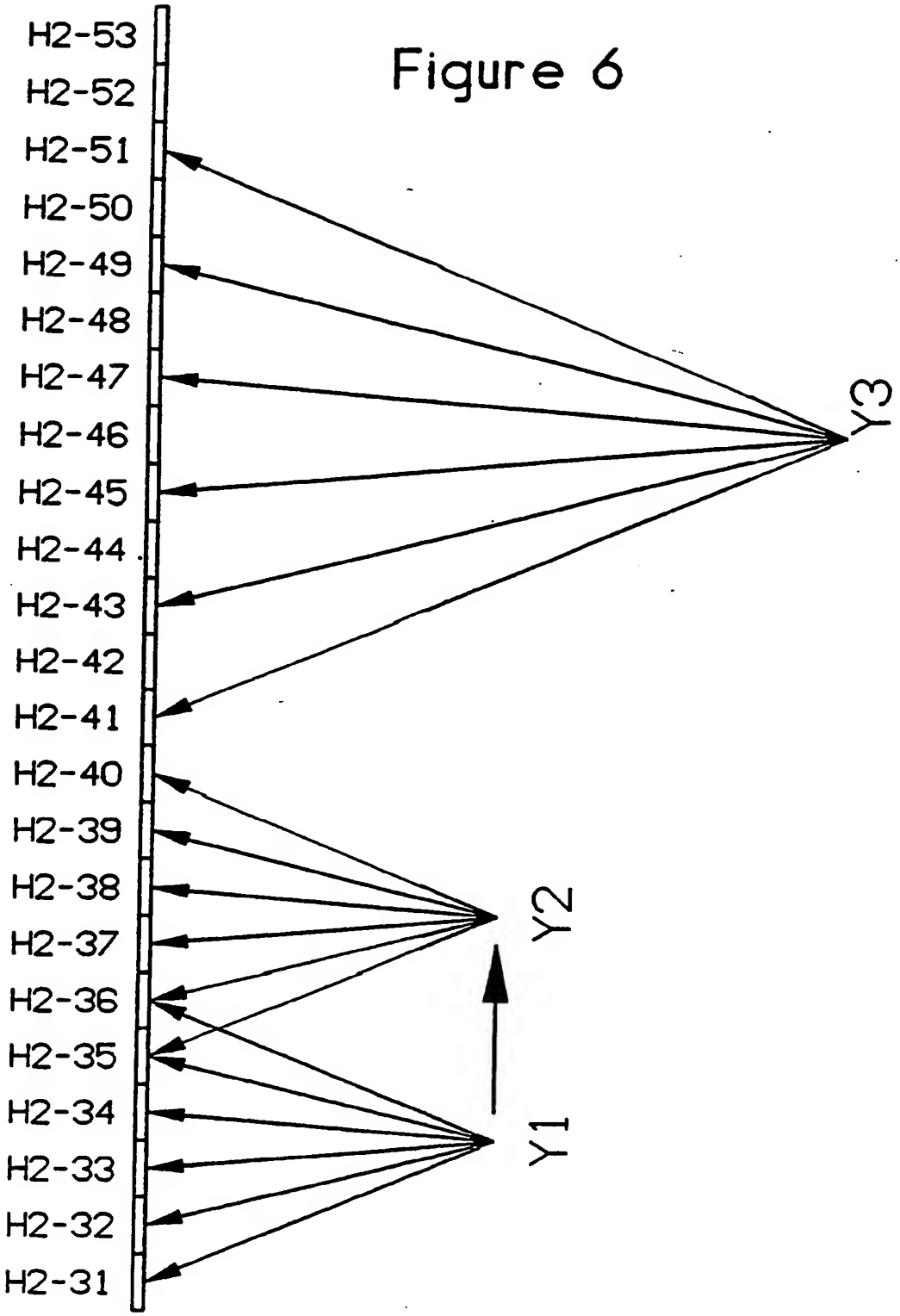


Figure 5b

Figure 6



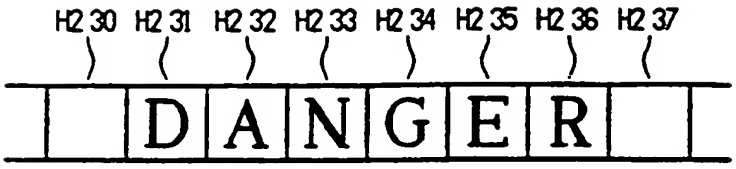


Figure 7a

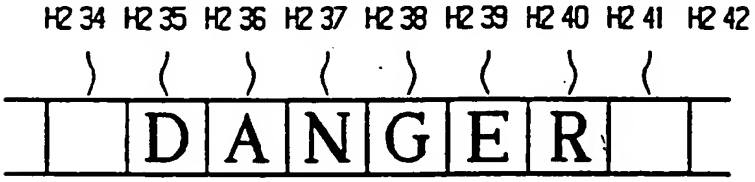


Figure 7b

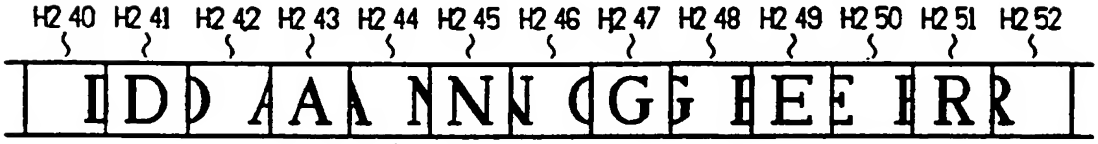


Figure 7c

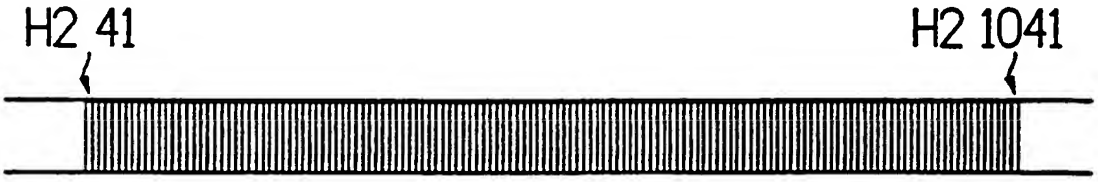


Figure 7d

Figure 7e

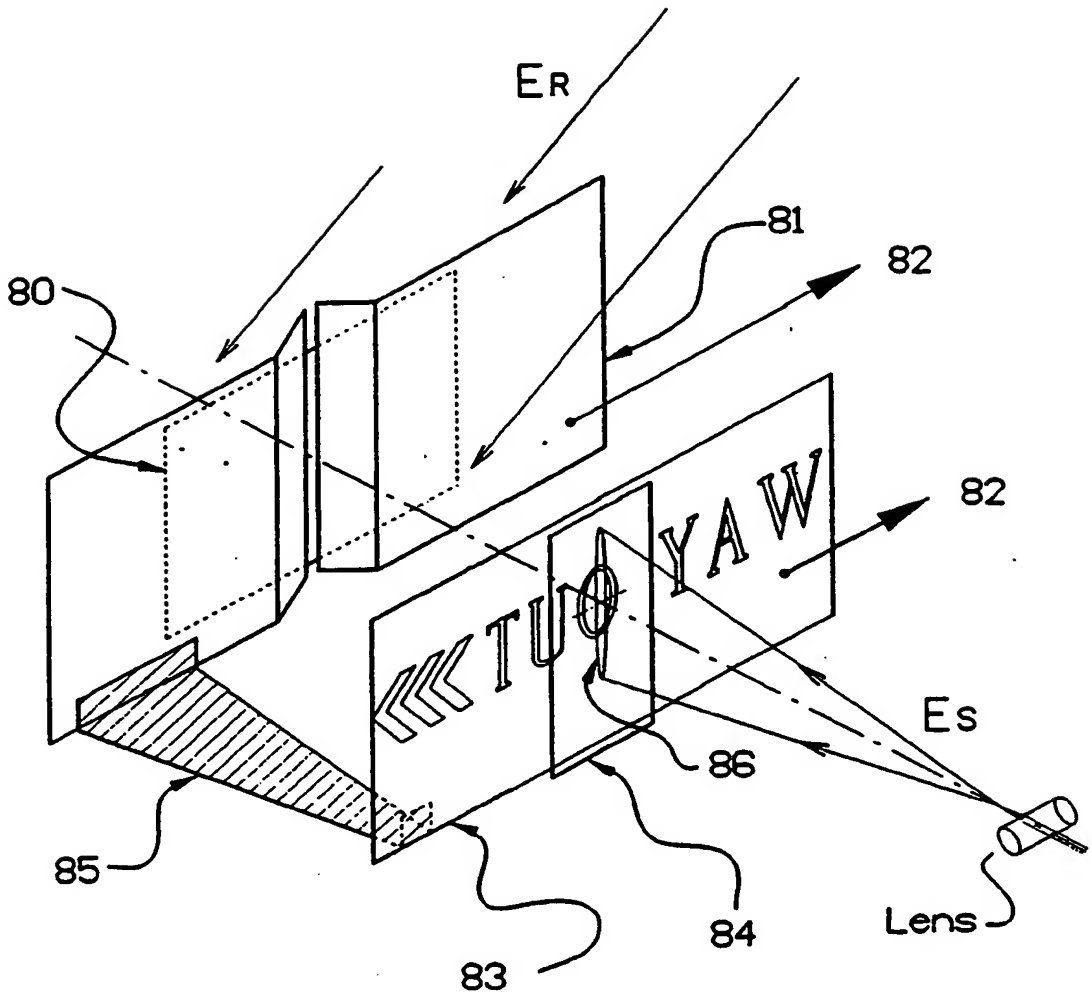
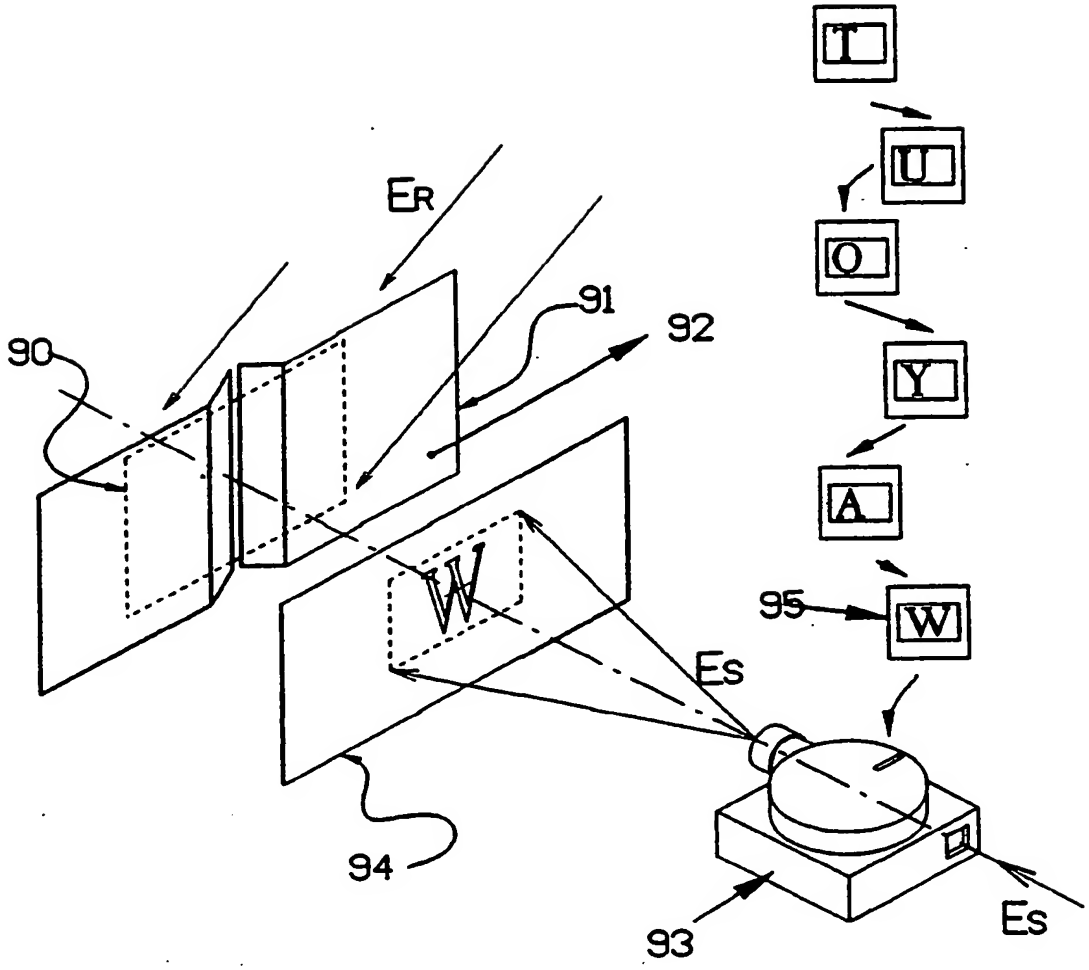


Figure 8



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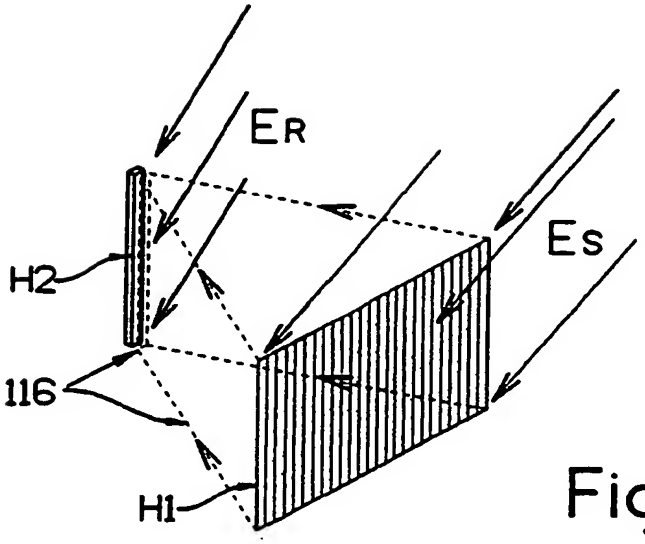


Figure 10

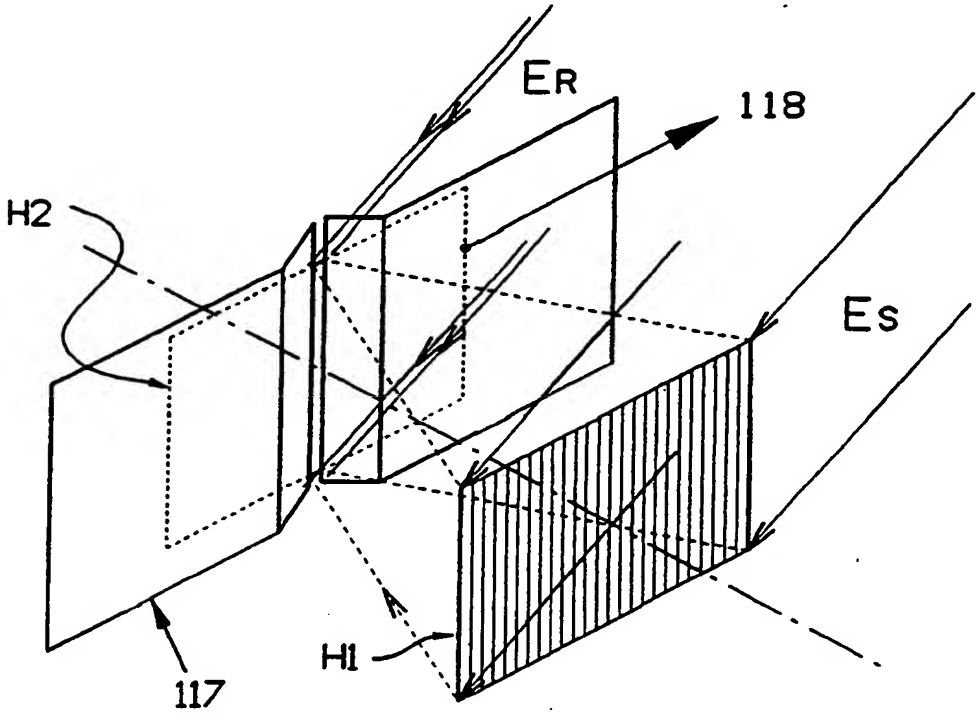


Figure 11

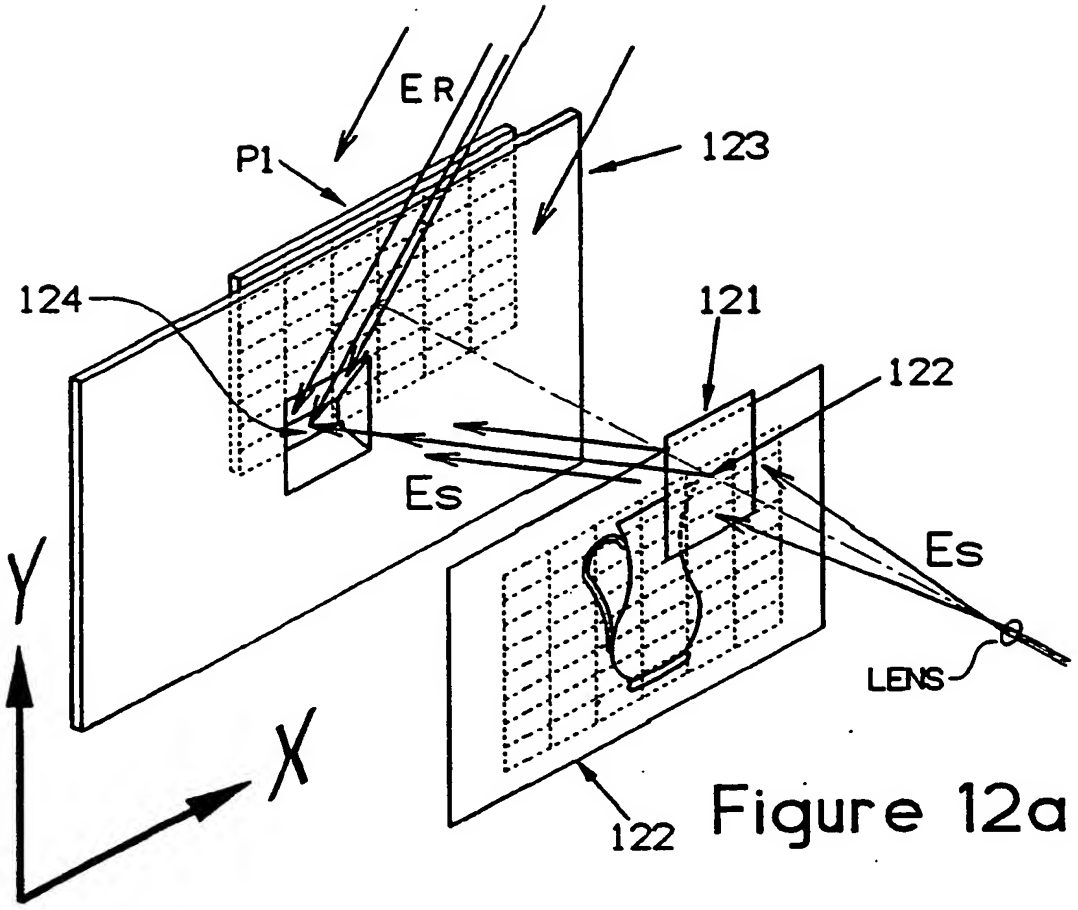


Figure 12a

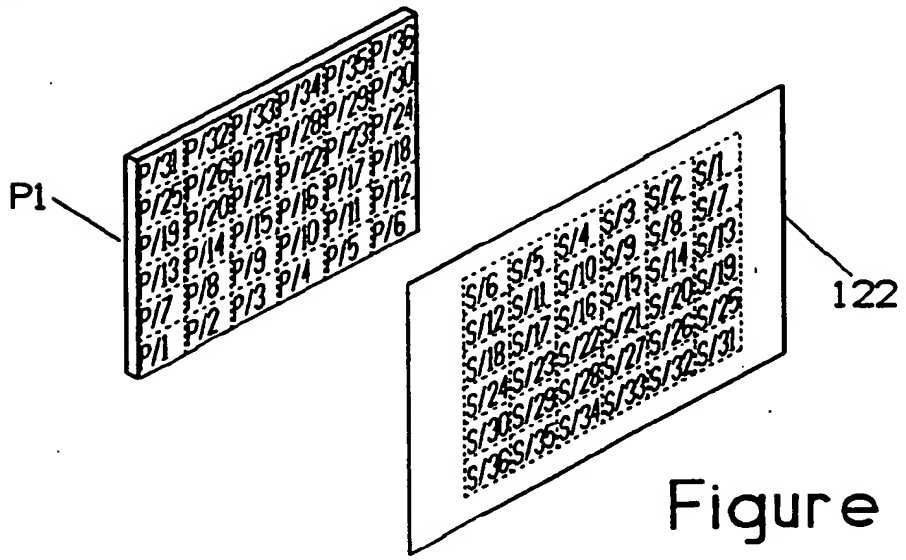


Figure 12b

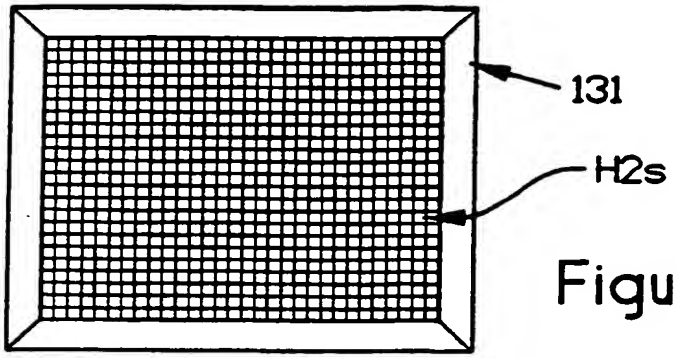


Figure 13a

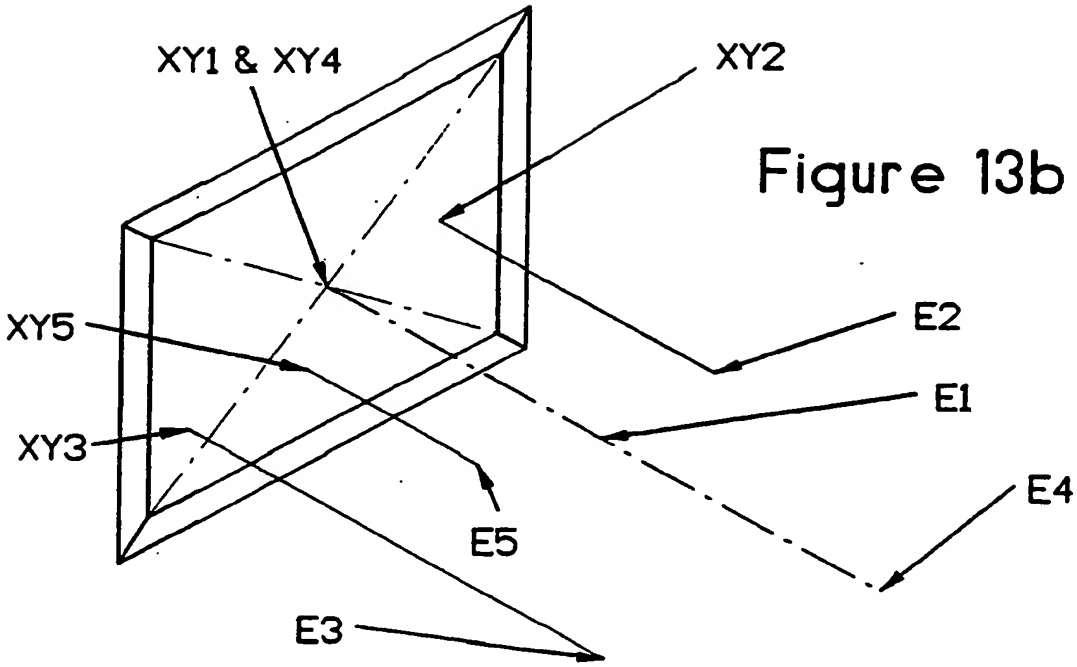


Figure 13b

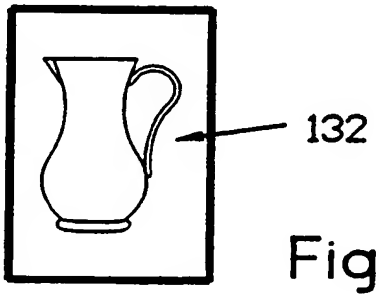


Figure 13c

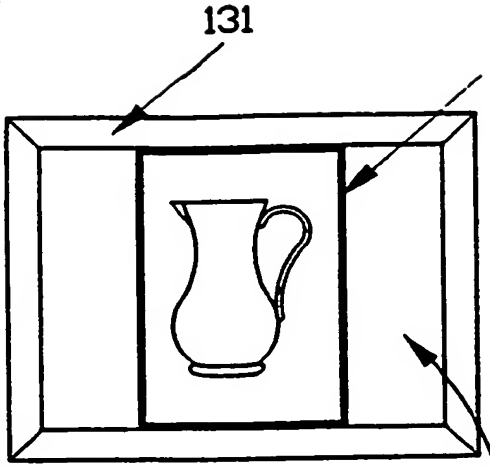


Figure 13d

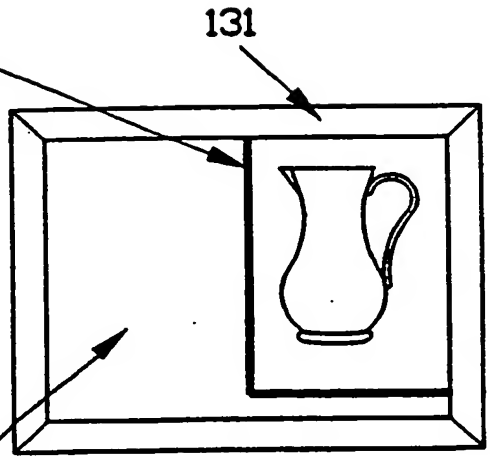


Figure 13e

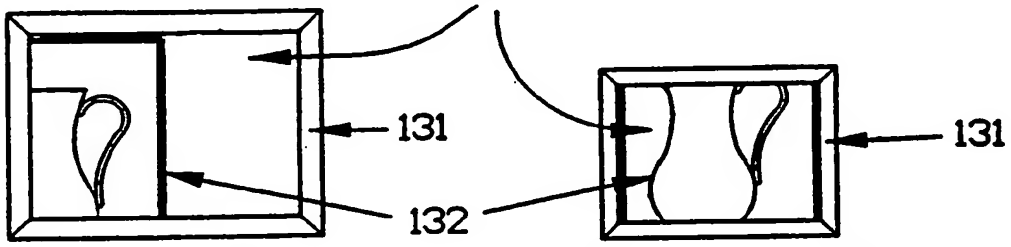


Figure 13f

Figure 13g

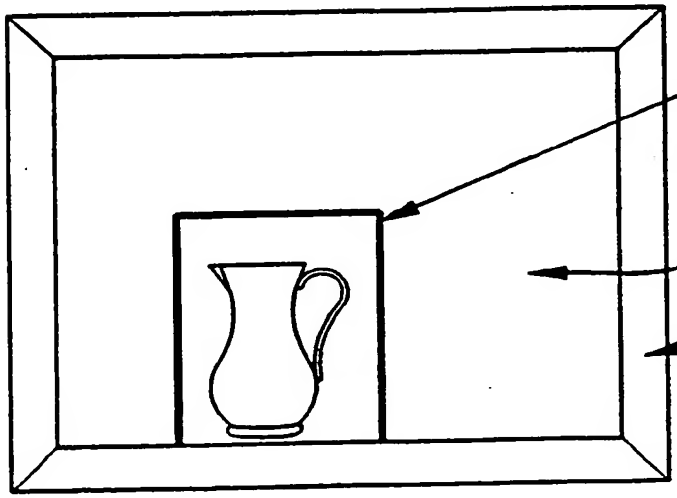


Figure 13h

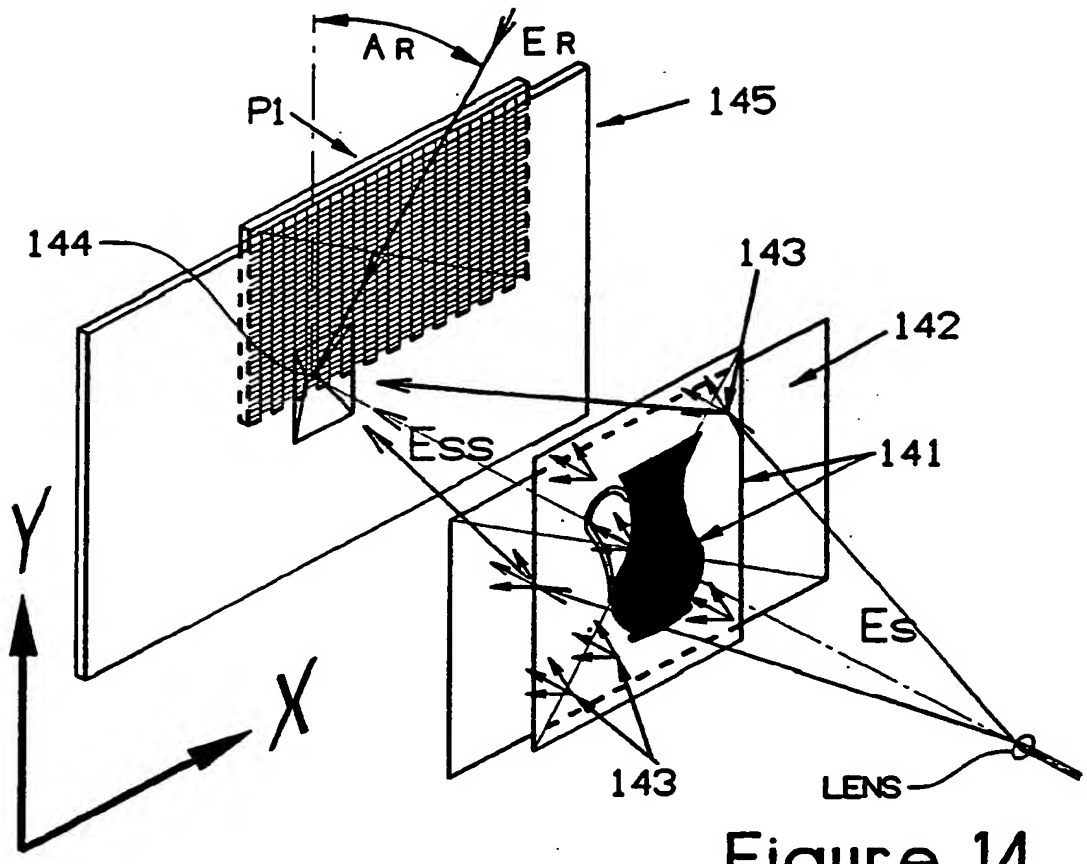


Figure 14

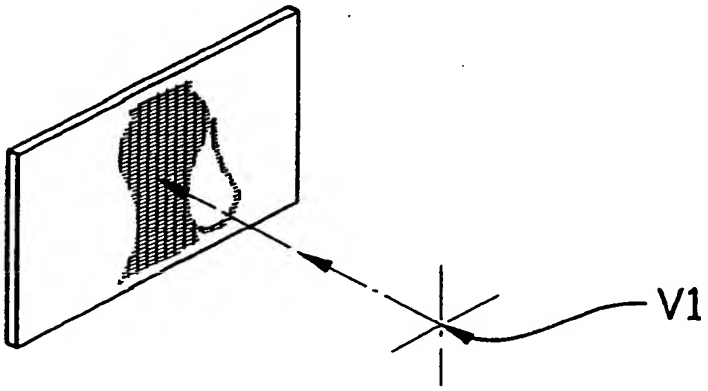


Figure 14b

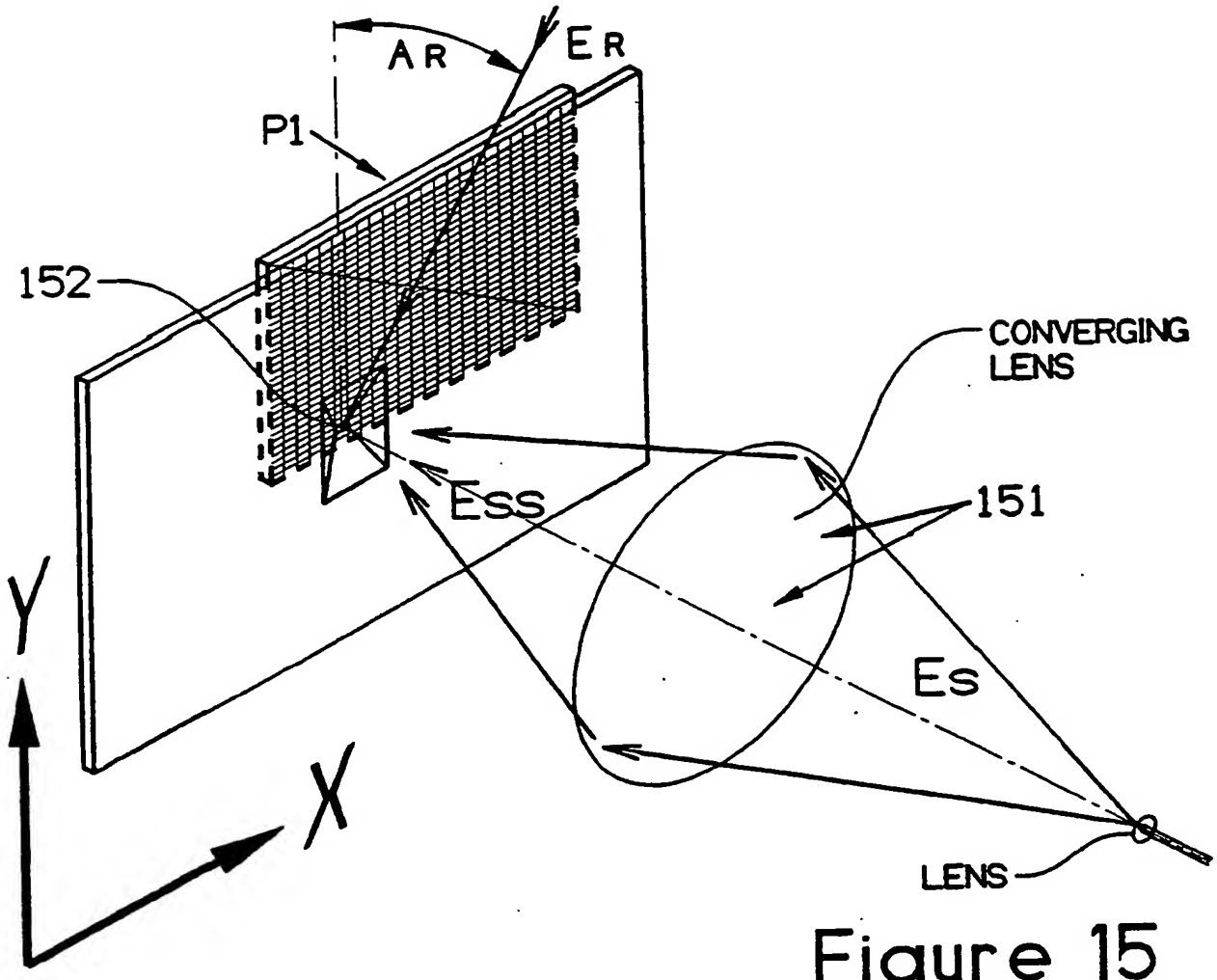


Figure 15

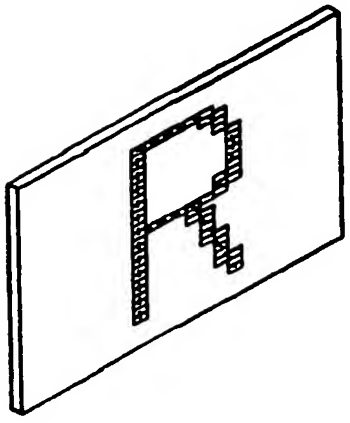


Figure 15a

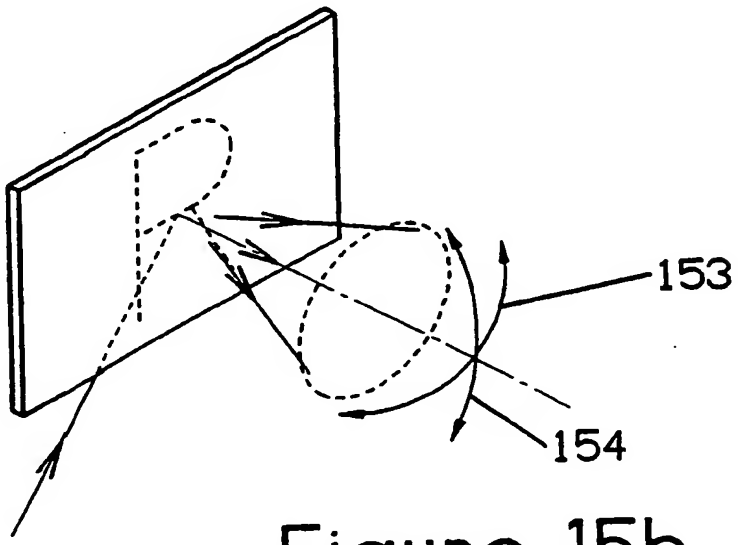
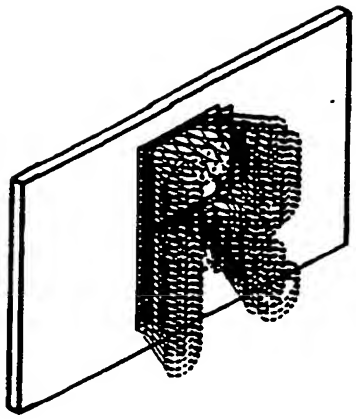


Figure 15b

Figure 15c



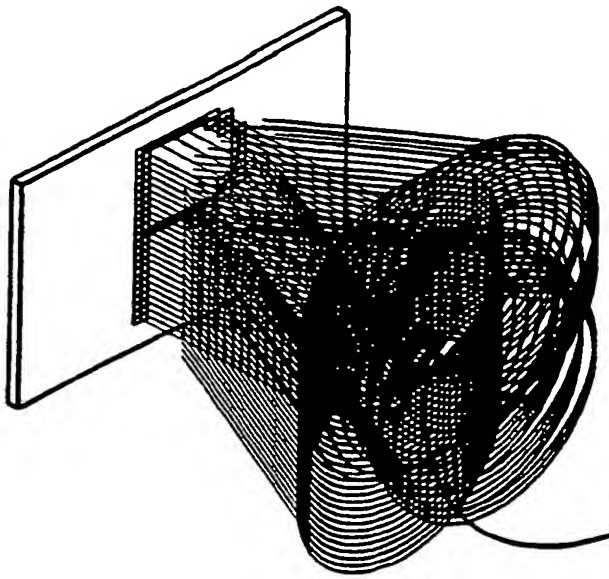


Figure 15d

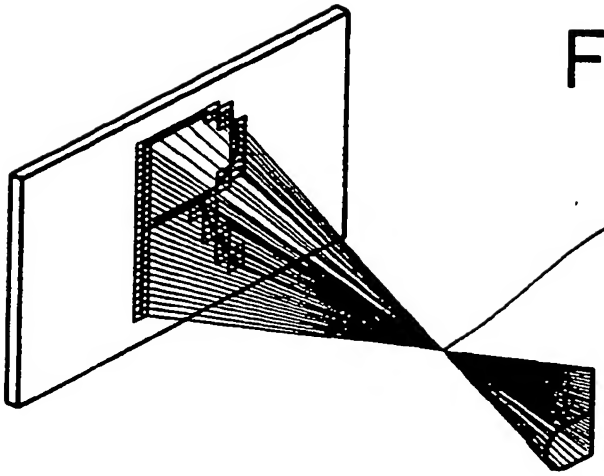


Figure 15e

INTERNATIONAL SEARCH REPORT

Interna al Application No
PCT/GB 94/00844

A. CLASSIFICATION OF SUBJECT MATTER
IPC 5 G03H1/26

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 5 G03H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US,A,5 056 880 (BARBANELL) 15 October 1991 see claim 1	1,3,9
Y	GB,A,1 278 672 (KONISHIROKU PHOTO INDUSTRY CO. LTD.) 21 June 1972 see claim 1	1,3,9
A	US,A,4 878 719 (WREEDE) 7 November 1989 see column 1, line 57 - line 60	1
A	GB,A,1 292 110 (CLAUDGEN LIMITED) 11 October 1972 cited in the application see figure 4	4,7,8, 11,12

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 July 1994	03. 08. 94

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl, Fax (+ 31-70) 340-3016	Kleikamp, B

Form PCT/ISA/210 (second sheet) (July 1992)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP,A,0 479 497 (XEROX CORPORATION) 8 April 1992 see column 10, line 57 - column 12, line 52	6,10
A	US,A,4 206 965 (MCGREW) 10 June 1980	

2

INTERNATIONAL SEARCH REPORT

Information on patent family members

Inter nal Application No
PCT/GB 94/00844

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
US-A-5056880	15-10-91	NONE		
GB-A-1278672	21-06-72	DE-A-	1931299	04-06-70
		GB-A-	1278673	21-06-72
US-A-4878719	07-11-89	NONE		
GB-A-1292110	11-10-72	NONE		
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